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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/776,228	02/12/2004	Je Won Kim	2336-241	2636

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EXAMINER	
MULPURI, SAVITRI	

ART UNIT	PAPER NUMBER
2812	

MAIL DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/776,228	KIM ET AL.	
	Examiner	Art Unit	
	Savitri Mulpuri	2812	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *13 February 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *2,3,6-8,10 and 22* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *2,3,6-8,10 and 22* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 2/13/08 has been entered.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 2-3, 6-8,10 , 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Orita et al (US 6,673,702) in combination with Nakamura et al (US 5,578,839)

Orita et al teaches growing GaN buffer layer on either sapphire substrate; treating the buffer layer in hydrogen atmosphere or hydrogen gas mixed with other gases in MOCVD, at temperature of 500- 900 ^{0}C, to remove oxide layer (see col. 4, lines 39-47; col. 7, lines 1-30); successively growing first GaN based layer, active GaN based layer and second GaN based layer on the buffer layer (see 7C). Orita et al also teaches growing first active and second GaN based layers in MOVPE or HVPE.

Though Orita et al teaches both HVPE and MOCVD for both buffer layer and active layers, Orita et al does not teach specifically which layer is grown by what technique. However, it is well known that HVPE give fast growth rate with low quality GaN layer and MOCVD give low growth rate and high quality and it is obvious to one of the ordinary skill in the art to grow buffer layer in HVPE at fast growth to get thick buffer layer and active layer in MOCVD with slow growth rate and thin layers for light emission. Using thick layer is essential as buffer layer because thick layer are useful not to cause any defects in the subsequent device layers.

Orita et al do not teach forming buffer layer being undoped buffer layer. Nakamura et al teaches GaN based undoped buffer layer on the substrate and then successively growing lower clad layer "16" and active layer "16"and upper clad layer "20" on the undoped buffer layer "14" (see fig 1 and col. 5, lines 65-67, col. 6, lines 5-21). It would have been obvious to one of ordinary skill in the art to form undoped buffer layer in the invention Orita et al because undoped buffer layer can be useful as insulating layer between the active layers by providing good isolation, and undoped buffer layer would not have problem of out diffusion of the dopants into the active layer because the buffer layer is undoped layer.

Heat-treating step in different ambient hydrogen containing gas such as hydrogen or ammonia or nitrogen at different temperature ranges depending on the ambient but do not teach an additional heat-treating step. However, The transposition of process steps or the splitting of one steps into two, where the Processes are substantially identical or equivalent in terms of function, manner

and result was held not to patentably distinguish the processes Ex parte Ruben 128 USPQ 440. Since the claims 7-8 heat treating step for step C is 800 C, step C ' is anywhere between 150-1000 C , Heat treating step at same temperature can be split into steps first using hydrogen gas and then switch to ammonia or nitrogen to obtain removing oxide and then improve the surface condition of the nitride semiconductor crystal film in a state where the oxide film is removed therefrom. It is well known the heat treatment in ammonia or nitrogen improves the surface quality by replenishing the nitrogen element, which is lost from the surface during the previous heat treatment.

In any case, as reasoned from well established legal precedent, it would have been an obvious matter of design choice bounded by well known manufacturing constraints and ascertainable by routine experimentation and optimization to split the heat treating step in Orita et al into two heat treating steps because applicant has not disclosed that the limitation is for a particular unobvious purpose, produces an unexpected result, or is otherwise critical, and it appears prima facie that the process would possess utility using multiple steps. Moreover, it has been held that the splitting of one step into two, where the processes are substantially identical or equivalent in terms of function, manner and result, is prima facie obvious absent a disclosure that the limitation is for a particular unobvious purpose, produces an unexpected result, or is otherwise critical. Ex parte Ruben 128 USPQ 159. Furthermore, it is well established that mere repetition or duplication to accomplish an expected additive function or result is prima facie obvious absent a disclosure that the repetition or duplication is for a particular **unobvious** purpose, produces an unexpected result, or is otherwise critical. See, for example, In re Ockert,

114 USPQ 330 (CCPA 1957); In re Schuelke, 96 USPQ 421 (CCPA 1953); In re Hertrich, 73 USPQ 442 (CCPA 1947); Long Mfg. N.C., Inc. v. Condec Corp., 223 USPQ 1213 (DC ENC 1984); St. Regis Paper Company v. Bemis Company, Inc., 193 USPQ 8 (CA 7 1977); In re Harza 124 USPQ 378 (CCPA 1960); Hofschneider Corp. v. Lane et al., doing business as Lane and Co., 71 USPQ 126 (DC WNY 1946).

It must be noted that the second heat-treating step, in the instant invention, is not crucial for the process because instant invention discloses the second step may be performed, which is interpreted as optional.

Claims 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over orita et al in combination with Nakamura et al as applied to claims 2-5,7-15,17-21 above, and further in view of Lee et al.

Orita et al doe not teach nitridation of the substrate. Lee teaches nitridation of the substrate. It would have been obvious to one of ordinary skill in the art to perform nitradation on the substrate prior to growing GaN based layer because such nitridation gives high quality nitride based semiconductor layers..

With respect to newly amended limitation, Orita inherently teaches amended claimed process. As explained above step b) process can preferably be done in HVPE because buffer layer is not part of the active device and can grown by fast growth HVPE process and step d) process can preferably be done MOCVD because the layers grown in step d) is part of the active device and can be grown in slow and MOCVD to from defect free layers. With respect to claim 22 Orita teaches forming a semiconductor layer 12 and taken out of the apparatus; forming and

removal of oxide on semiconductor layer and then reintroduce to oxide into the chamber (col.4, lines 13-22). Note Orita gives a choice of growing semiconductor layer "12" in either HVPE or MOCVD and similarly growing active layer in either HVPE or MOCVD.

Response to Arguments

Applicant's arguments with respect to claims 2-3, 6-8, 10, 22 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Savitri Mulpuri whose telephone number is 571-272-1677. The examiner can normally be reached on Mon-FRi from 8 a.m. to 4.30 p.m. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Lebentritt, can be reached on 571-272-1873 The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Savitri Mulpuri
Primary Examiner
Art Unit 2812

/Savitri Mulpuri/

Primary Examiner, Art Unit 2812